

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all other listings of claims.

1. (CURRENTLY AMENDED) A biocompatible composition comprising microbubbles encapsulating a gas within a shell comprising a plurality of compounds, each compound having a polar head group groups, each polar head group linked to a straight-chained straight-chain hydrophobic group selected as having different chain lengths sufficient for longer chains to assemble beneath adjacent shorter chains thereby enhancing rigidity of the shell, the hydrophobic groups oriented toward the gas, wherein the compounds have the structure

R₁-X-Z;

R₂-X-Z;

and R₃-X-Z'

where R₁, R₂ and R₃ are hydrophobic groups selected from the group consisting of straight-chain alkyls, alkylethers, alkylthioethers, alkyldisulfides, polyfluoroalkyls, and polyfluoroalkylethers having a carbon chain length greater than or equal to 16 and less than or equal to 32 and where R₁ is greater than R₂ and R₁ is greater than or equal to R₃; R₃ has one or more such hydrophobic groups having the same or different lengths; X is a linker connecting the hydrophobic group to the polar head group; Z is a polar head group selected from the group consisting of CO₂⁻M⁺, SO₃⁻M⁺, SO₄⁻M⁺, PO₃⁻M⁺, PO₄⁻M⁺, N(R)₄⁺, a pyridinium or substituted pyridinium group, and a zwitterionic group; R is selected from the group consisting of -H, -CH₃, alkyl, cycloalkyl, substituted cycloalkyls containing one or more heteroatoms, and benzyl and can be the same or different; and Z' is a nonionic group.

2. CANCELED

3. (CURRENTLY AMENDED) The composition of ~~Claim 2~~ claim 1 wherein R₁, R₂ and R₃ are ~~straight-chained~~ straight-chain alkyl groups having from about 20 to 30 carbon atoms.

4. (CURRENTLY AMENDED) The composition of ~~Claim 2~~ claim 1 wherein X is selected from the group consisting of -(CH₂)_m-, -(CH₂)_mCO₂(CH₂)_n-, -(CH₂)_mCONH(CH₂)_n-, -(CH₂)_mNHCONH(CH₂)_n-, -(CH₂)_mOCONH(CH₂)_n-, -(CH₂)_mO(CH₂)_n-, -(CH₂)_mNH(CH₂)_n-, -(CH₂)_mN[(CH₂)_m]₂-, -(CH₂)_mS(CH₂)_n-, -(CH₂)_m-, -(CH₂)_mSO(CH₂)_n-, -(CH₂)_mSO₂(CH₂)_n-, -(CH₂)_mNH(CH₂)_nCO₂(CH₂)_o-, -[(CH₂)_m]₂N(CH₂)_nCONH(CH₂)_o-, where m, n, and o are the same or different and are less than 5, DL-lysine, aspartic acid, glutamic acid, serine, cysteine,

homocysteine, cystine, serinol, itaconic acid, tigilic acid, maleic acid, DL-malic acid, succinic acid, tartaric acid, malonic acid, citric acid, phthalic acid, terephthalic acid, N,N-bis[2-hydroxyethyl]-2-aminoethanesulfonic acid, N,N-bis(2-hydroxyethyl)glycine, 3-[N,N-bis(2-hydroxyethyl)amino]-2-hydroxypropanesulfonic acid, N-tris[hydroxymethyl]methyl-3-aminopropanesulfonic acid, and N-tris[hydroxymethyl]glycine.

5. (CURRENTLY AMENDED) The composition of ~~Claim 2~~ claim 1 wherein Z' is selected from the group consisting of polysorbates, polyglycerols, polypeptides, polynucleotides, polysaccharides, polyvinylpyrrolidones, polyvinylalcohols, polyethyleneglycols, and combinations thereof.

6. (CURRENTLY AMENDED) The composition of ~~Claim 2~~ claim 1 wherein Z' is poly(ethyleneglycol) with the number of ethyleneglycol monomer units greater than or equal to 20.

7. (CURRENTLY AMENDED) A method for obtaining an ultrasound contrast image of body tissue comprising:

administering into a body a biocompatible composition useful as an ultrasound contrast agent comprising microbubbles encapsulating a gas within a shell comprising a plurality of compounds, each compound having a polar head group groups, each polar head group linked to a ~~straight-chained~~ straight-chain hydrophobic group selected as having different chain lengths sufficient for longer chains to assemble beneath adjacent shorter chains thereby enhancing rigidity of the shell, the hydrophobic groups oriented toward the gas wherein the compounds have the structure:

R₁-X-Z;

R₂-X-Z;

and R₃-X-Z'

where R₁, R₂ and R₃ are hydrophobic groups selected from the group consisting of straight-chain alkyls, alkylethers, alkylthioethers, alkyldisulfides, polyfluoroalkyls, and polyfluoroalkylethers having a carbon chain length greater than or equal to 16 and less than or equal to 32 and where R₁ is greater than R₂ and R₁ is greater than or equal to R₃; R₃ has one or more such hydrophobic groups having the same or different lengths; X is a linker connecting the hydrophobic group to the polar head group; Z is a polar head group selected from the group consisting of CO₂⁻M⁺, SO₃⁻M⁺, SO₄⁻M⁺, PO₃⁻M⁺, PO₄⁻M⁺, N(R)₄⁺, a pyridinium or substituted pyridinium group, and a zwitterionic group; R is selected from the group consisting of -H, -CH₃, alkyl, cycloalkyl, substituted

cycloalkyls containing one or more heteroatoms, and benzyl and can be the same or different;
and Z' is a nonionic group, and

taking an ultrasound image of the desired tissue.

8. (CANCELED)

9. (CURRENTLY AMENDED) The method of ~~Claim 8~~ claim 7 wherein R₁, R₂ and R₃ are ~~straight-~~
~~chained~~ straight-chain alkyl groups having from about 20 to 30 carbon atoms.

10. (CURRENTLY AMENDED) The method of ~~Claim 8~~ claim 7 wherein X is selected from the group consisting of $-(CH_2)_m-$, $-(CH_2)_mCO_2(CH_2)_n-$, $-(CH_2)_mCONH(CH_2)_n-$, $-(CH_2)_mNHCONH(CH_2)_n-$, $-(CH_2)_mOCONH(CH_2)_n-$, $-(CH_2)_mO(CH_2)_n-$, $-(CH_2)_mNH(CH_2)_n-$, $-(CH_2)_mN[(CH_2)_m]_2-$, $-(CH_2)_mS(CH_2)_n-$, $-(CH_2)_m-$, $-(CH_2)_mSO(CH_2)_n-$, $-(CH_2)_mSO_2(CH_2)_n-$, $-(CH_2)_mNH(CH_2)_nCO_2(CH_2)_o-$, $-(CH_2)_m]_2N(CH_2)_nCONH(CH_2)_o-$, where m, n, and o are the same or different and are less than 5, DL-lysine, aspartic acid, glutamic acid, serine, cysteine, homocysteine, cystine, serinol, itaconic acid, tigilic acid, maleic acid, DL-malic acid, succinic acid, tartaric acid, malonic acid, citric acid, phthalic acid, terephthalic acid, N,N-bis[2-hydroxyethyl]-2-aminoethanesulfonic acid, N,N-bis(2-hydroxyethyl)glycine, 3-[N,N-bis(2-hydroxyethyl)amino]-2-hydroxypropanesulfonic acid, N-tris[hydroxymethyl]methyl-3-aminopropanesulfonic acid, and N-tris[hydroxymethyl]glycine.

11. (CURRENTLY AMENDED) The method of ~~Claim 8~~ claim 7 wherein Z' is selected from the group consisting of polysorbates, polyglycerols, polypeptides, polynucleotides, polysaccharides, polyvinylpyrrolidones, polyvinylalcohols, polyethyleneglycols, and combinations thereof.

12. (CURRENTLY AMENDED) The method of ~~Claim 8~~ claim 7 wherein Z' is poly(ethyleneglycol) with the number of ethyleneglycol monomer units greater than or equal to 20.

13. (CURRENTLY AMENDED) The method of ~~Claim 8~~ claim 7 wherein the tissue is the heart and the image is a myocardial perfusion image.

14-20. (CANCELED)